Limited joint mobility in children and adolescents with insulin dependent diabetes mellitus

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Abstract

Joint mobility was studied in 70 children with insulin dependent diabetes mellitus aged 8–17 years, and the prevalence of limited joint mobility (LJM) was found to be 31% (22/70). This figure fell to only 7% (5/70) when an alternative method of assessment was used. A high number of non-diabetic, non-sibling controls (6/51 (12%)) were found to have LJM. There was a trend towards an increasing prevalence of LJM with increasing age and duration of diabetes, but it was also found in patients with recent onset diabetes. A large proportion of prepubertal patients were noted to have LJM. No correlation was found between LJM and either short stature or diabetic control.

There is a need for standardisation of the methods used to define and stage LJM in diabetic patients, and the significance of this clinical finding remains unclear.

Many studies have reported that limited joint mobility (LJM) is common in young patients with insulin dependent diabetes mellitus.[1-4] Studies largely agree on a prevalence figure of 30–35%, but differ as to whether or not there is a correlation between LJM and factors such as age, duration of diabetes, and diabetic control. One study has suggested that the presence of LJM characterises a population at increased risk for the development of microvascular complications.[2]

The methodology used in studies of joint mobility has varied, with some based on assessment of the interphalangeal joints alone,[1 5] whereas others have included both small and large joints in their evaluation.[2-4]

A more recent study evaluated joint mobility using goniometry techniques and suggested that LJM was no more prevalent in a group of diabetic patients than in controls.[6]

The aims of this study were to look for the presence of LJM in a group of young diabetic patients and to see how it correlated with other variables.

Patients and methods

SUBJECTS

Seventy young patients (38 male, 32 female) with insulin dependent diabetes mellitus, aged 8·0 to 17·0 years (mean (SD) 13·1 (2·6)), were studied. These patients were participating in a larger project looking at autonomic nervous function in young diabetics, hence the lower age cut off of 8 years. Patients with any major illness not related to their diabetes were excluded. The patients were otherwise unselected and were all attending a diabetic clinic under the care of one consultant paediatrician. Duration of diabetes ranged from 0·3 to 14·7 years (mean (SD) 5·4 (3·9)).

The control subjects were 51 healthy non-related children (28 male, 23 female) of similar ages, ranging from 8·6 to 18·5 years (12·5 (2·8)).

METHODS

Joint mobility was assessed and staged using the criteria described by Rosenbloom *et al.*[2] The table summarises the mode of assessment of each joint. The stages are as follows: stage 0=no limitation: includes equivocal or unilateral findings; stage 1=mild limitation: involvement of one or two interphalangeal joints, one large joint, or only the metacarpophalangeal joints bilaterally; stage 2=moderate limitation: involvement of three or more interphalangeal joints or one finger joint and one large joint bilaterally; stage 3=severe limitation: moderate limitation plus cervical spine involvement or obvious hand deformity at rest.

Diabetic control was assessed by HbA1 measured by affinity electrophoresis (Glycophore kit, Gelman Sciences) and by fructosamine using the Roche kit method (Roche, Welwyn Garden City). Each child had his height measured by the same observer with a stadiometer, and the height centile was found using Tanner-Whitehouse charts. Puberty was staged using Tanner's standards.

In the diabetic patients the presence of retinopathy was determined by a series of colour retinal photographs taken on both eyes through a dilated pupil. Each patient also provided at least two timed overnight urine specimens for estimation of albumin excretion rate. The urinary albumin concentration was measured by an immunoturbidimetric method.

The statistical significance of the results was evaluated using the χ^2 test.

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Assessment of limited joint mobility

Joint	Movement	Minimum expected angle of attainment (deg)
IP* joints of hands	Extension	180
MCP* joints	Extension	60
Wrist	Extension	70
Elbow	Extension	180
Ankle	Dorsiflexion	100
Cervical spine	Ear to shoulder	+/−
Thoracolumbar spine	Lateral flexion	35

*IP=interphalangeal; MCP=metacarpophalangeal.

Results

Twenty two diabetic patients were found to have LJM, giving a prevalence of 31% for this population. Of these, 17 were stage 1 and five were stage 2. No patients were classified as stage 3.

In the control group a prevalence of 12% (6/51) with LJM was found: all of these were stage 1. The prevalence of LJM in the diabetic patients was significantly higher than in the control group (p<0·05).

Importantly, if the patients were reclassified on the basis of extension at the interphalangeal joints alone (the so-called 'prayer sign') the prevalence of LJM in the diabetic patients fell to only 7%, with none of the control group having any abnormalities as they all had bilateral limitation of extension at the metacarpophalangeal joints only.

There was a higher prevalence of LJM in patients aged 15 years and over (10/24; 42%) than in those aged less than 15 years (12/46; 26%). The prevalence was also higher in patients with diabetes' duration of 10 or more years (5/12; 42%) compared with 29% (17/58) in patients with diabetes for less than 10 years). Two patients with stage 1 LJM, however, had been diagnosed for less than one year. A slightly higher prevalence was seen in males than females in both the diabetic and the control groups. There was no relation between the presence of LJM and diabetic control as assessed by a single measurement of HbA1 and fructosamine.

Puberty did not seem to influence joint mobility in this study: the prevalence of LJM was 26% (11/42) in prepubertal diabetics and 39% (11/28) in pubertal patients. In the control group there were equal numbers of prepubertal and pubertal patients with LJM.

No relation was found between height and LJM: in particular, short stature was not more common in patients with LJM. In fact, of the five diabetics with stage 2 LJM, four had heights above the 90th centile for chronological age.

Seven of the 70 diabetic patients studied (10%) had retinopathy on colour retinal photographs, but only one of these had LJM (stage 1). Only one of the patients had an albumin excretion rate >14 µg/min on two or more timed overnight urine specimens (the level said to be predictive of incipient nephropathy[7]), and she did not have LJM.

Discussion

The prevalence of LJM in the diabetic patients studied here is similar to that found previously[1–4] and is significantly higher than in the control population. A surprisingly high number of healthy controls (12%) were also classified as having LJM. Although this figure is much higher than in most other studies where non-diabetic controls have been used, Kavanagh et al found no difference in joint mobility index between young patients with insulin dependent diabetes mellitus and age related controls.[6] In all age groups (including older patients with non-insulin dependent diabetes mellitus) they

found that the prayer sign was present in 27% of diabetics and 17% of controls.

Another interesting finding was the large discrepancy in the prevalence found when a different method was used for assessing LJM: this emphasises the need for a strict standardisation of the criteria used to define the various stages of LJM. Traisman et al used the prayer sign alone to assess LJM and found a prevalence of 8·4% in young diabetic patients,[5] which is similar to the figure of 7% found in this study when only the prayer sign was used.

In this study an increased prevalence of LJM was noted with increasing chronological age and duration of diabetes. These results, as with those in many other studies, must be interpreted with caution, as they may be artefactual when the samples are from single clinic populations: patients aged 16 years or over are often seen in adolescent or adult clinics, whereas this sample was from a paediatric clinic only.

This study did not show any relation between growth delay and the presence of LJM: in fact most of our patients with stage 2 LJM were tall for their age. This is the opposite of findings in other studies.[1 3 4]

Another finding here which was in conflict with many other studies was the high prevalence of LJM in prepubertal patients. Some researchers have reported that this is extremely rare, although more recently a prevalence of 23·9% was found in patients showing Tanner stages 1 and 2.[4]

There was no relation between the presence of retinopathy or nephropathy and LJM in this study. The significance of this observation is difficult to intrepret, however, as this is a paediatric population where complications are relatively rare.

In conclusion, this study confirms the increased prevalence of LJM in the diabetic population. It emphasises the need for a standard method of assessment of joint mobility if studies are to be compared and the significance of abnormalities to be fully evaluated. In this group of patients there was no relation between short stature and LJM, and a high prevalence in prepubertal patients: both of these findings are in conflict with many previous studies.

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